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INVENTION REPORT

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Title of invention:
URL addressing in DVB streams

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Short description of invention:
There are several possibilities for addressing specific data in broadcasted MPEG-2 transport stream. In this invention is presented an URL addressing scheme, in which server name, service name and file name are used together to point to a certain file delivered using DSM-CC data download.

In my/our opinion the invention belongs to category:*) (Not necessary to fill in) A	Enclosures: 1

The invention becomes public: / 19

I/we consider the invention to belong to the category indicated above and to my/our best knowledge, I am/we are the sole/and original inventor(s) of this invention.

The company may, by virtue of the valid legislation, be entitled to full or partial rights to the invention. I/we acknowledge my/our obligation to sign as inventor(s) all documents that may be required for protecting the invention in different countries.

Signature of inventor(s):
Date 3 / 11 19 96
Signature

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I ACKNOWLEDGE RECEIPT OF THE COMPANY'S DECISION REGARDING THE INVENTION INDICATED ABOVE

Signature of inventor(s):
Date 3 / 1 19 97

2

INVENTION REPORT RECEIVED

Code: 7652	Company: MNT	Department: 985

Place: Tampere Date: 7.11.1996
Signature:

3

OPINIONS

(Yes = 1, maybe = 2, no = 3)
Technical level
☐ new
☐ practicable
☐ patentable
Development level
☐ ready for protecting
☐ development work continues
☐ idea worthy of development
Marketing level
☐ highly valuable
☐ star product
☐ worthy of patenting
Level of protection
☐ important to protect
☐ easy to defend
☐ difficult to evade
In my opinion the invention belongs to category____*)

I propose that the reported invention be
☐ reserved by the company
☐ left for the use of the inventor(s)
Place: Date:

Signature:

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REPLY TO THE INVENTOR(S)

I make it known hereby that the company has decided to:
☐ reserve the invention for the company
☐ reserve the right to use the invention
☐ allow the inventor(s) the liberty for independent action
☐ issue the enclosed statement

☐ keep the invention secret
☐ apply for a patent on the invention
☐ refrain from applying for a patent on the invention
☐ postpone the decision about applying for a patent
The invention belongs to category____*)

If dissatisfied with this decision, the inventor(s) may appeal within 30 days to the Board of the company.

Announcement reward:

Place: Date:

EXHIBIT ONE

NOKIA
Multimedia Network Terminals

Kimmo Djupsjöbacka, Kimmo Löytänä,
Pasi Toiva, Seppo Vuori

REPORT
6.11.1996

STREAM NAME SERVICE IN DVB NETWORKS USING MPEG-2 TRANSPORT STREAMS

Background Information

There are at least four different ways to point to a specific HTML file in an MPEG stream. These should be considered when defining addressing mechanisms for interactive television environments.

The first possibility is to use HTTP addresses as they are usually used in internet networks. A typical address would be in the form *http://www.server.net/directory_name/.../file_name*. This does not demand any changes on the network side except in the network gateway, but it demands implementation of a TCP/IP stack on the client, and the possible use of IP over MPEG. IP over MPEG definitions are being developed in the MPEG, DAVIC and DVB organizations. This type of addressing is most suitable for files which are really fetched from the internet.

DSM-CC client software will be implemented on many DVB Interactive Services compliant terminals. This means that the DSM-CC User-to-User type of addressing will be used for accessing broadcast object carousels and interactive service files. This is very similar to internet addressing, since object carousels also form hierarchical structures and can have server names. This would allow us to use the same addressing mechanism for both interactive and broadcast data and, in the case of broadcast object carousels, there would be no need to implement a TCP/IP stack for terminals.

DSM-CC data carousels can be used for broadcasting any data files without a hierarchical structure. They could be used for receiving HTML pages, if we agree on a common addressing mechanism. Implementation of support for data carousels demands less resources and it will be an attractive addressing mechanism, especially for simple receivers supporting lightweight advanced teletext applications

In the DVB Transport Stream, different services are addressed by a combination of the original_network_id, transport_stream_id and service_id values. This leads to server addresses like: *dvb://original_network_id.transport_stream_id.service_id,* and allows the hierarchy to be extended within the server, for example file address could be: *dvb://original_network_id.transport_stream_id.service_id/directory_name/.../file_nam.* A similar approach is proposed by, for example, Philips [1].

The fourth approach is proposed in this invention report. Using the approach described above would lead to similar troubles as with using IP numbers on the internet. For several reasons, a broadcaster might change the PID of a certain service - just as a network administrator sometimes has to change a certain machine's IP-number while restructuring his network. PIDs may also get remapped in some network components, for example when a cable-TV operator retransmits and remultiplexes TV programs from

satellite (Picture 1). A similar event in a TCP/IP network would occur when a server is moved from one network segment to another. For this reason it would be better to use a name based SNS addressing mechanism in the DVB broadcast streams.

In TCP/IP networks, the IP address of a computer can be, for example, 123.1.1.10, but the same computer also has a name, in this case kielo.uta.fi, which is registered in a domain name service database. Numerical IP addresses are used by the network for routing etc. but alphanumerical names are easier to remember, and in most cases can be kept static even if the numerical IP address changes. Similarly, it would be better to use name addressing for MPEG streams instead of numbers, e.g. service_name.service_provider_name rather than original_network_id.transport_stream_id.service_id.

Stream Name Service for Files in DVB Networks using MPEG-2 Transport Stream

Since the MPEG transport streams in a DVB network can be uniquely addressed using the numerical original_network_id, transport_stream_id and service_id addresses, we need a mechanism for binding names. A solution for this is presented below.

In this invention, DVB Service Information (SI)[3] with private extensions is used to define a binding between the service_provider name and a uniquely identified service in the DVB system. The unique identification of the service in the DVB system comes from a combination of original_network_id, transport_stream_id and service_id. The original_network_id is uniquely defined within the DVB area and values are regulated by ETSI[5]. The transport_stream_id is defined to be unique within original_network_id, and service_id within transport_stream_id. In addition, event_id is defined to be unique within service_id. The DVB SI contains a Service Description Table (SDT) and an Event Information Table (EIT) which give information on services and events, respectively.

For each uniquely identified service in the SDT or event in the EIT, there is a place for descriptors (descriptor loop) giving information on that particular service or event, respectively. The DVB has defined descriptors to be used in this loop and it has also defined a way to include private descriptors. This is done by using the private_data_specifier_descriptor, which indicates that the following descriptors until the end of the loop or until the next private_data_specifier_descriptor are privately defined by the organization corresponding to the private_data_specifier value (allocated in [5]) in the private_data_specifier_descriptor.

The name binding is done in this invention by inserting a private descriptor containing the names of the service_provider and service into the SDT. If the service contains time dependent data, the private descriptor is also inserted into the EIT (Picture 2). The descriptor is called the SNS_addressing_descriptor.

Syntax for the SNS_addressing_descriptor is:

```
SNS_addressing_descriptor(){
        descriptor_tag
        descriptor_length
        service_provider_name_length
        for(i=0;i<N;i++){
                char
        }
        service_name_length
        for(i=0;i<N;i++){
                char
        }
        component_tag
}
```

The differences between this and the service descriptor, which is usually included in the same loop in the SDT, are that service type is not included and special control codes in the characters are not allowed. In addition, a unique allocation of service_provider_name and service_name are not required in the service descriptor.

The SNS_addressing_descriptor does not have to be used as a private descriptor if this mechanism is accepted by ETSI and a specific tag is allocated to it.

To guarantee the unambiguity of addresses, the service_provider names must be allocated globally. This can be handled as in the Internet society, so that service_provider names are issued by an organisation in the same way that Internet domain names are issued. Service names can then be managed locally by the service providers - just as server names are managed inside each Internet domain.

Using SNS with URL Addressing and DSM-CC Data Carousels

A Universal Resource Locator (URL) is an addressing mechanism used for pointing to files on Internet servers for World Wide Web services. Usually these addresses are presented in the following form: *protocol://server_name/directory_name/.../file_name*. It would be useful to be able to use the same style of addressing on interactive services for television, e.g. for a browser on a television.

A normal HTTP URL address looks like *http://www.uta.fi/directory_name/.../file_name*, though the form: *http://123.1.1.10/directory_name/.../file_name* can also be used. As described above in DVB compliant MPEG-2 transport streams, URL addresses should be in the form: *dsmcc_dc://service_provider_name/service_name/file_name*, rather than: *dvb://original_network_id.transport_stream_id.service_id/file_name*. See Picture 3 for an example.

In the example solution, a DSM-CC data carousel [2] is used for broadcasting the data contents. In this case, one carousel on one PID is considered as one service, and a

service can consist of several files. The file (and directory path) is identified by module_id and declared in the data carousel's DownloadInfoIndication message.

DSM-CC data carousels are a mechanism for transmitting modules (files) over broadcast streams. In DSM-CC terminology, the data carousel carries modules, which can be considered as files, and these modules are transmitted by dividing them into blocks. The DownloadInfoIndication message(s) function as a directory for binding names and various other parameters to numerical module_ids that are used in the data block packets. Thus, the DownloadInfoIndication provides the mechanism for mapping the file name into the numerical lower protocol layer parameters.

References:

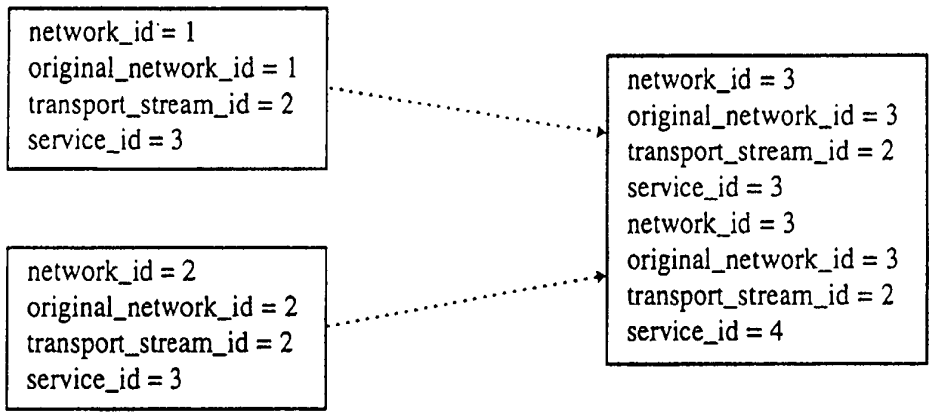
[1] Opportunities for migration of Internet and Digital TV; Jan van der Meer; Philips;
http://www.w3.org/pub/WWW/AudioVideo/9610_Workshop/paper27/paper27.html

[2] ISO/IEC 13818-6. Digital Storage Media Command and Control: International Standard. Pre-editing release. 12-July-1996.

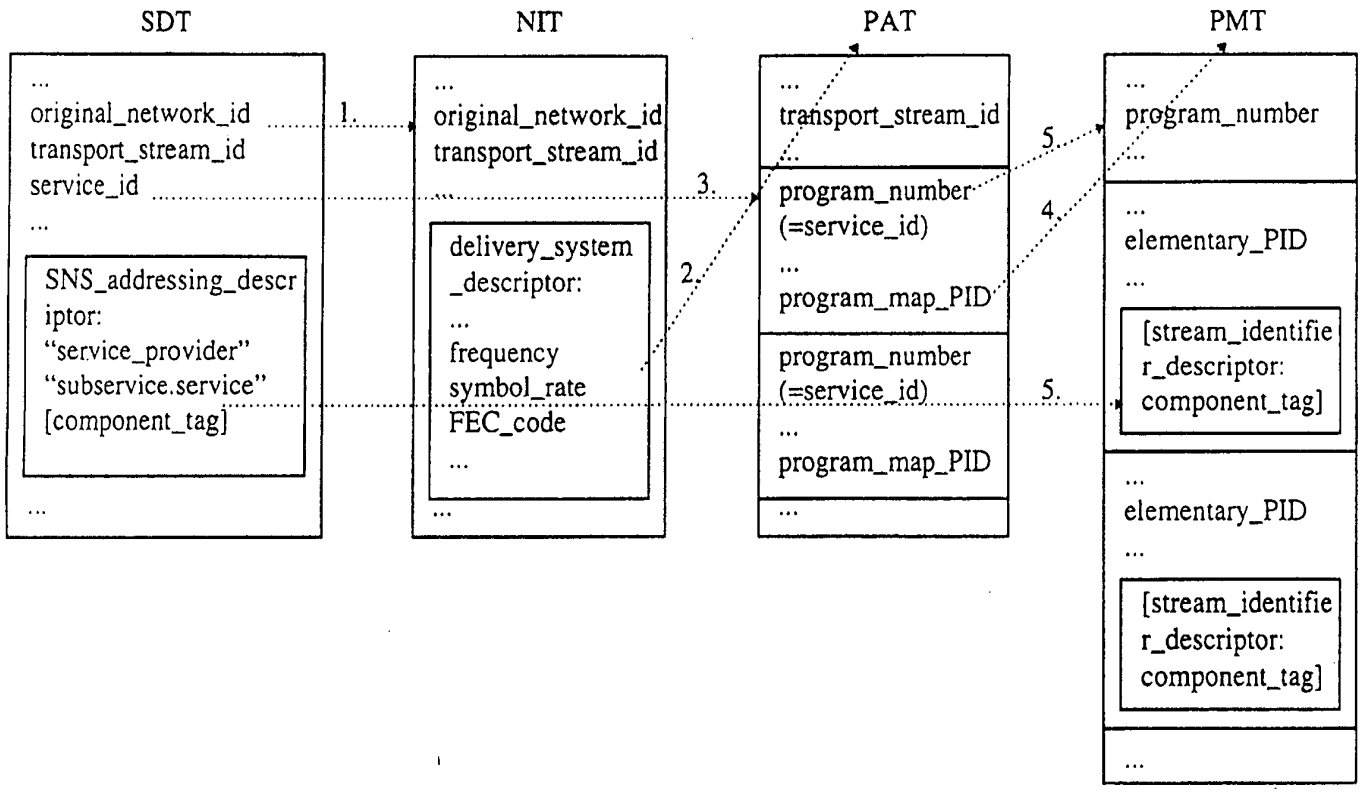
[3] EBU/ETSI JTC: "Digital broadcasting systems for television, sound and data services; Specification for Service Information (SI) in Digital Video Broadcasting (DVB) systems". European Telecommunications Standard ETS 300 468, October 1995.

[4] ISO/IEC 13818-1: "Information technology - Generic coding of moving pictures and associated audio: Systems", 13 November 1994.

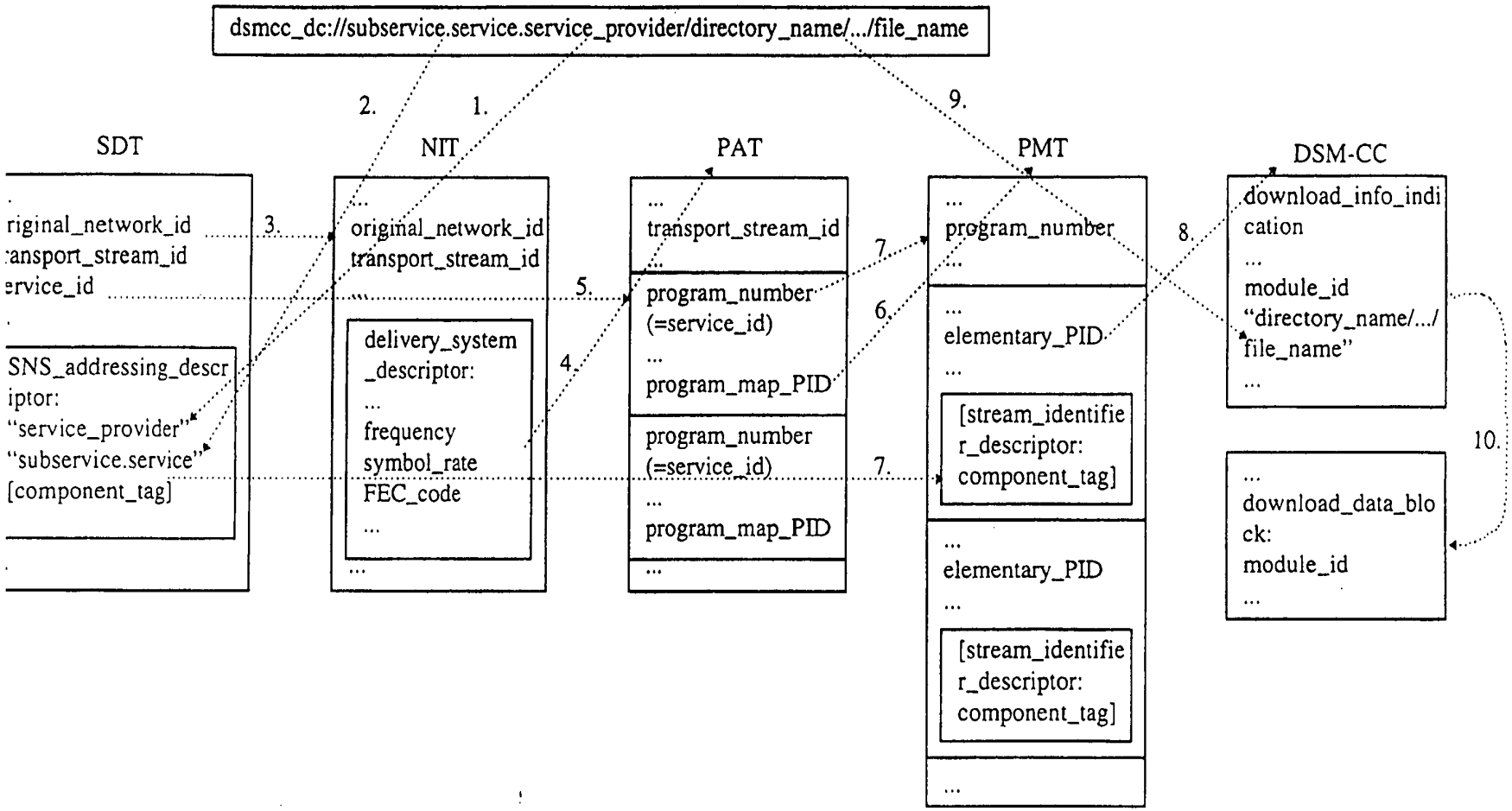
[5] EBU/ETSI JTC: "Digital broadcasting systems for television, sound and data services; Allocation of Service Information (SI) codes for Digital Video Broadcasting (DVB) systems". ETSI Techical Report ETR 162, October 1995.


network_id = 1
original_network_id = 1
transport_stream_id = 2
service_id = 3
network_id = 2
original_network_id = 2
transport_stream_id = 2
service_id = 3
network_id = 3
original_network_id = 3
transport_stream_id = 2
service_id = 3
network_id = 3
original_network_id = 3
transport_stream_id = 2
service_id = 4

Picture 1.


SDT
NIT
PAT
PMT
...
original_network_id
transport_stream_id
service_id
...
SNS_addressing_descr
iptor:
"service_provider"
"subservice.service"
[component_tag]
...
1.
...
original_network_id
transport_stream_id
...
delivery_system
_descriptor:
...
frequency
symbol_rate
FEC_code
...
...
3.
2.
...
transport_stream_id
...
program_number
(=service_id)
...
program_map_PID
program_number
(=service_id)
...
program_map_PID
...
5.
4.
5.
...
program_number
...
...
elementary_PID
...
[stream_identifie
r_descriptor:
component_tag]
...
elementary_PID
...
[stream_identifie
r_descriptor:
component_tag]
...

Picture 2.


dsmcc_dc://subservice.service.service_provider/directory_name/.../file_name
SDT
NIT
PAT
PMT
DSM-CC
riginal_network_id
ansport_stream_id
ervice_id
SNS_addressing_descr
iptor:
"service_provider"
"subservice.service"
[component_tag]
original_network_id
transport_stream_id
delivery_system
_descriptor:
frequency
symbol_rate
FEC_code
transport_stream_id
program_number
(=service_id)
program_map_PID
program_number
(=service_id)
program_map_PID
program_number
elementary_PID
[stream_identifie
r_descriptor:
component_tag]
elementary_PID
[stream_identifie
r_descriptor:
component_tag]
download_info_indi
cation
module_id
"directory_name/.../
file_name"
download_data_blo
ck:
module_id
1.
2.
3.
4.
5.
6.
7.
7.
8.
9.
10.

Picture 3.